

What is claimed is:

1. A method for inducing differentiation of mammalian embryonic stem cells into functioning cells, which comprises the steps of:

5 1) culturing the mammalian embryonic stem cells together with feeder cells with a medium comprising leukemia inhibitory factor;

10 2) culturing the cells obtained from step 1) in absence of feeder cells with a medium comprising leukemia Inhibitory factor and basic FGF in a suspension culture condition to give embryonic bodies;

 3) culturing the obtained embryonic bodies with a selection-expanding medium; and

15 4) culturing the obtained cell clusters with a differentiation medium to give functioning cells.

2. The method of claim 1, wherein the medium used in step 2) comprises about 100-10000 U/ml of leukemia inhibitory factor.

20 3. The method of claim 1, wherein the medium used in step 2) comprises about 2-100 ng/ml of bFGF.

4. The method of claim 1, wherein the medium used in step 3) comprises nicotinamide, insulin and fibronectine in a serum-free cell culture medium.

25 5. The method of claim 1, wherein the functioning cells are insulin producing pancreatic islet-like cell clusters.

6. The method of claim 5 wherein the medium used in step 4) comprises nicotinamide, insulin and laminin in a serum-free cell culture medium.

7. The method of claim 1, wherein the functioning cells are
5 nerve-like cells.

8. The method of claim 7 wherein the medium used in step 4) comprises L-lysine, insulin and laminin in a serum-free cell culture medium.

9. Functioning cells induced from mammalian ES cells by the
10 method of claim 1.

10. Insulin secreting cell clusters induced from mammalian ES cells by the method of claim 5.

11. Nerve-like cells induced from mammalian ES cells by the method of claim 7.

12. A method for treating a mammalian patient having
15 disorders in pancreatic islet function, which comprises implanting pancreatic islet-like cell clusters induced from allogenic ES cells by the method of claim 5 to the patient.

13. The method of claim 12, wherein the patient is a type I
20 diabetic patient.

14. A method for treating a mammalian patient having disorders in nerve function, which comprises implanting nerve-like cells induced from allogenic ES cells by the method of claim 7 to the patient.